



CENTRAL UNIVERSITY OF KERALA

കേരള കേന്ദ്രീയ വിശ്വവിദ്യാലയ

DEPARTMENT OF PLANT SCIENCE

Sl: No:	Name Of Student	Register Number	Year of Admission	Title Of Thesis	Guide	Type Of Work	Place Of Work
1.	ADILA ABDULLA	BPS051901	2019	Validation of putative host targets with differential expression pattern during pomegranate bacterial blight disease	Dr. GINNY ANTONY	Experimental	CUK
2.	AISWARYA R NAIR	BPS051902	2019	Comparison of different organosolv pretreatments on biomass delignification	Dr. Chithra Manisseri	Experimental	CUK
3.	AMRITHA PP	BPS051903	2019	Identification of salt stress responsive proteins in <i>Kandelia candel</i> (L.) Druce Is a bonafide work done by	Dr. Ajay Kumar	Experimental	CUK
4.	ANASWARA S MENON	BPS051904	2019	Optimizing volume: surface area for cultivating commercially important two microalgae <i>Chlorella</i> sp. and <i>Dunaliella</i> sp.	Dr. K. Arun Kumar	Experimental	CUK
5.	ANJANA HAREENDRAN K.V	BPS051906	2019	Expression analysis of a host gene during Bacterial Leaf Blight Disease,	Dr. GINNY ANTONY	Experimental	CUK
6.	ANJANA RK	BPS051907	2019	In vitro propagation and preliminary phytochemical analysis in <i>Centrosema molle</i> Mart. ex Benth,	Dr. Dennis Thomas T	Experimental	CUK
7.	ANJITHA R.	BPS051908	2019	In silico analysis of putative binding sites of abiotic stress-responsive transcription factors in <i>Arabidopsis thaliana</i>	Dr. Jasmine M. Shah	Experimental	CUK



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केरल केन्द्रीय विश्वविद्यालय

DEPARTMENT OF PLANT SCIENCE

				DNA repair genes and, their expression profiling			
8.	ARCHANA K	BPS051909	2019	Micropropagation, phytochemical and antibacterial studies in <i>Lepidagathis ananthapuramensis</i> - a new species from the lateritic plateaus of Kerala, India	Dr. Dennis Thomas T	Experimental	CUK
9.	ARCHANA K NAIR.	BPS051910	2019	Investigating the role of <i>Xanthomonas axonopodis</i> pv. <i>punicae</i> type III effector xop V	Dr. GINNY ANTONY	Experimental	CUK
10.	ARPITHA M	BPS051911	2019	In vitro propagation, Phytochemical and antibacterial studies in <i>Calotropis gigantea</i> Linn. R. Br,	Dr. Dennis Thomas T	Experimental	CUK
11.	ASHLY BABU	BPS051912	2019	Evaluation of the biofuel potential of finger millet biomass	Dr. Chithra Manisseri	Experimental	CUK
12.	ASWIN S KUMAR	BPS051913	2019	Screening of extracellular laccase activity in soil bacteria	Dr. Chithra Manisseri	Experimental	CUK
13.	AYSHA ROOBY M. K	BTY051914	2019	Cell wall based biochemical study of <i>Kandelia candel</i> (L.) Druce roots in response to salinity stress	Dr. Ajay Kumar	Experimental	CUK
14.	DRISHYA D	BTY051915	2019	Analysing the regulation and expression of <i>Arabidopsis thaliana</i> transcription factors involved in pathogenesis	Dr. Jasmine M. Shah	Experimental	CUK



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15.	FEMINA K	BPS051916	2019	Micropropagation, phytochemical and antibacterial studies in <i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp	Dr. Dennis Thomas T	Experimental	CUK
16.	HENNA PARVEEN K.	BPS051918	2019	Profiling of regulatory regions and expression patterns of genes involved in systemic acquired resistance	Dr. Jasmine M. Shah	Experimental	CUK
17.	INDUKUMARI U K	BPS051919	2019	Analysis of nutritional and antioxidant components of underutilized food crops	Dr. Ajay Kumar	Experimental	CUK
18.	NALLURI MADHURI	BPS051920	2019	Extraction, characterization and biological activities of fucoxanthin in the decoction prepared from four brown seaweeds for value addition to Tea	Dr. K. Arun Kumar	Experimental	CUK
19.	NIMITHA K	BPS051921		Cloning of TAL effector genes from <i>Xanthomonas axonopodis</i> pv. <i>punicae</i>	Dr. GINNY ANTONY	Experimental	CUK
20.	NISHMITHA KUMARI S R RAI	BPS051922	2019	Screening of ignored traditional leafy vegetables for nutritional and antioxidant components	Dr. Ajay Kumar	Experimental	CUK
21.	PULI SRI LAKSHMI POOJITHA	BPS051923	2019	Isolation and Screening of soil bacteria producing acetyl xylan esterase and xylanase		Experimental	CUK
22.	PRIYANKA RATHOD	BPS051924	2019	Nanoparticles synthesized by compounds of marine algae for drug delivery	Dr. K. Arun Kumar	Experimental	CUK



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23.	REDDYMALLA VENKATESH	BPS051925	2019	Phytochemical and Antibacterial activity of <i>Rhynchoisa aurea</i> (Willd.) DC. Leaf extracts.	Dr. Dennis Thomas T	Experimental	CUK
24.	RAHNA RAJ P	BPS051926	2019	Validation of Gene expression pattern of host targets during bacterial blight disease of rice	Dr. GINNY ANTONY	Experimental	CUK
25.	RASHIDA	BPS051927		Volume to surface-area ratio on the growth of three microalgae <i>Coalestrella</i> <i>saipanensis</i> , <i>Chroococcus</i> sp. and <i>Haematococcus pluvialis</i>	Dr. K. Arun Kumar	Experimental	CUK
26.	RESHMA JOHN	BPS051928	2019	Micropropagation, phytochemical and antibacterial studies in <i>Dregea volubilis</i> Benth.	Dr. Dennis Thomas T	Experimental	CUK
27.	RESHMA P	BTY051929	2019	Anatomical responses to salinity stress in <i>Kandeliacandel</i> (L.) Druce with special emphasis on suberin, lignin deposition and aerenchym formation in its roots	Dr. Ajay Kumar	Experimental	CUK
28.	RINIYA NAJEEB	BPS051930	2019	Profiling of putative regulatory regions and expression of genes involved in Induced Systemic Resistance	Dr. Jasmine M. Shah	Experimental	CUK
29.	SAJANA S	BPS051931	2019	Proximate Composition Analysis and Mineral Profiling	Dr. Ajay Kumar	Experimental	CUK



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DEPARTMENT OF PLANT SCIENCE

				of Selected Traditional Leafy Vegetables			
30.	SANDEEP KUMAR MOHANTA	BPS051932	2019	Phytochemical and antibacterial analysis in <i>Crotalaria pallida</i> Aiton	Dr. Dennis Thomas T	Experimental	CUK
31.	SHAIJAL K	BPSO51933	2019	Isolation of protein from the red seaweed <i>Gracillaria edulis</i> associated with endophytic bacteria	Dr. K. Arun Kumar	Experimental	CUK
32.	SHANIBA	BPSO51934	2019	Promoter Analysis of Genes Involved In Epigenetic Regulation In Arabidopsis And, Their Expression Profiling During Pathogen Stress	Dr. Jasmine M. Shah	Experimental	CUK
33.	SHIMA N N	BTY051935	2019	Delignification efficiency of acidic ionic liquid [TEA][HSO ₄] on grass biomass	Dr. Chithra Manisseri	Experimental	CUK
34.	SITHARA NAZAR PT	BPSO51936	2019	Characterization and biological activities of various fractions of extracts obtained from the marine brown alga <i>Spathoglossum asperum</i> J. G. Agardh	Dr. K. Arun Kumar	Experimental	CUK
35.	SRUTHI B	BTY051937	2019	In Silico Analysis of Putative Transcription Factor Binding Sites and Expression Profiling of DNA Repair Genes of <i>Arabidopsis thaliana</i>	Dr. Jasmine M. Shah	Experimental	CUK
36.	STARLET M M	BPS051938	2019	Delignification efficiency of	Dr. Chithra	Experimental	CUK



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**DEPARTMENT OF
PLANT SCIENCE**

				different organosolv pretreatments on sugarcane leaves	Manisseri		
37.	VISHNU C K	BTY051939	2019	Characterization and biological activity of fractionated and depolymerized polysaccharide extracted from red seaweed <i>Solieria robusta</i> (Greville) Kylin	Dr. K. Arun Kumar	Experimental	CUK

**Validation of putative host targets with differential
expression pattern during pomegranate bacterial
blight disease**

THESIS

*Submitted to the Central University of Kerala in partial fulfillment of
the requirement for the award of the Degree of*

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

ADILA ABDULLA

Reg.No:BPS051901



DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

MAY 2021

**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**



CERTIFICATE

This is to certify that the Dissertation entitled “**Validation of putative host targets with differential expression pattern during pomegranate bacterial blight disease**” is an authentic record of the research work accomplished by Ms. ADILA ABDULLA towards partial fulfillment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Prof. Arun Kumar K
Head, Department of Plant Science
Central University of Kerala,
Kasaragod

Dr. Ginny Antony
Assistant Professor
Dept. of Plant Science

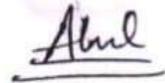
External Examiner:

Place: Tejaswini hills, Periy

Date: MAY 2021

DECLARATION

I hereby declare that the project entitled “**Validation of putative host targets with differential expression pattern during pomegranate bacterial blight disease**” submitted to Central university of Kerala in partial fulfillment of the requirements for the award of the degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of **Dr. Ginny Antony**, Assistant professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the Project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



ADILA ABDULLA

Place: **Tejaswini hills, Periy**e

Dated: 22 MAY 2021

COMPARISON OF DIFFERENT ORGANOSOLV PRETREATMENTS ON BIOMASS DELIGNIFICATION

**DISSERTATION SUBMITTED TO
DEPARTMENT OF PLANT SCIENCE**



*In partial fulfilment of requirement for the award of the Degree of
Master of Science in Botany*

By

AISWARYA R NAIR

Reg No. BPS051902

**Department of Plant Science
School of biological science
Central university of Kerala
Periye, 671 320
Kasaragod, Kerala, India
May, 2021**

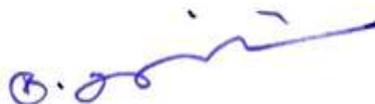
CERTIFICATE

This is to certify that the M.Sc. dissertation titled '**COMPARISON OF DIFFERENT ORGANOSOLV PRETREATMENTS ON BIOMASS DELIGNIFICATION**' is a bonafide record of the dissertation work carried out by Ms. AISWARYA R NAIR under my guidance and supervision that no parts of these has been presented before for the award of any degree or diploma.



Signature of the supervisor
Dr. Chithra Manisseri
Assistant professor
Department of plant science
School of biological science
Periye- 671320
Kasaragod, Kerala.

Signature of the Examiner



Signature of HOD
Prof. K. Arunkumar
Professor
Head of department Plant Science
School of Biological Sciences
Central University of Kerala
Periye-671 320
Kasaragod, Kerala

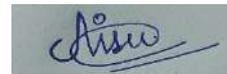
Periye
23/05/2021

DECLARATION

I hereby declare that the project entitled '**COMPARISON OF DIFFERENT ORGANOSOLV PRETREATMENTS ON BIOMASS DELIGNIFICATION**' is a bonafide record of the original research work carried out by me under the guidance of Dr. Chithra Manisseri, Assistant professor, Department of Plant science, Central university of Kerala and that no parts of this report has been presented earlier for any other degree, diploma or similar titles of any other university.

Periye

23/05/2021



AISWARYA R NAIR

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department Of Plant Science



CERTIFICATE

**This is to certify that the dissertation titled
Identification of salt stress responsive proteins in *Kandelia candel* (L.) Druce
Is a bonafide work done by**

AMRITHA PP

BPS051903

IV Semester M. Sc. Botany

**Supervised by
Dr. Ajay Kumar (Assistant Professor)
Department of Plant Science
Central University of Kerala
Kasaragod**

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department Of Plant Science



CERTIFICATE

This is to certify that the dissertation entitled “Identification of salt stress responsive proteins in *Kandelia candel* (L.) Druce” submitted by Amritha P.P., BPS051903 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Dr. Ajay Kumar

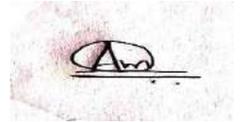
Signature of Examiner

Signature of HOD

Prof. (Dr) K. Arun Kumar, Head

DECLARATION

I hereby declare that this work has been carried out by me under the guidance of and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.

A handwritten signature in black ink, appearing to be 'Amritha P P', written over a horizontal line. The signature is slightly slanted and has a cursive style.

Place: Periy

Amritha P P

Date: 23/05/2021

BPS051903

**Optimizing volume: surface area for cultivating
commercially important two microalgae *Chlorella* sp.
and *Dunaliella* sp.**

DISSERTATION

Submitted to Central University of Kerala in the partial fulfilment of
the requirement for the award of the degree of
Master of Science in Plant Science

Submitted by,

Anaswara S Menon

BPS051904



Department of Plant Science

Central University of Kerala



CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This is to certify that the dissertation entitled “**Optimization of surface to volume ratio for commercially important two microalgae *Chlorella* sp. and *Dunaliella* sp.**” submitted by Anaswara S Menon toward the partial fulfillment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Dr. K. Arun Kumar
Professor
Head Department of Plant Science
Central University of Kerala

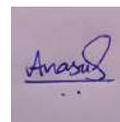
Signature of Examiner

Signature Head of Department

Dr. K. Arun Kumar
Professor
Head, Department of Plant Science
Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance of and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



Place:

Anaswara S Menon

Date:

BPS051904

**Expression analysis of a host gene during Bacterial
Leaf Blight Disease.**

THESIS

*Submitted to the Central University of Kerala in partial fulfilment of
the requirement for the award of the Degree of*

MASTER OF SCIENCE IN BOTANY

Submitted by

ANJANA HAREENDRAN K.V

Reg.No: BPS051906



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD
MAY 2021**

**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**



CERTIFICATE

This is to certify that the Dissertation entitled **“Expression analysis of a host gene during Bacterial Leaf Blight Disease”** is an authentic record of the research work accomplished by Ms. ANJANA HAREENDRAN K.V towards partial fulfilment for the Degree of Master of Science in Botany, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Prof. Arun Kumar K
Head, Department of Plant Science
Central University of Kerala,
Kasaragod

Dr. Ginny Antony
Assistant Professor
Dept. of Plant Science

External Examiner:

Place: Tejaswini hills, Periyar

Date:

DECLARATION

I hereby declare that the project entitled "**Expression analysis of a host gene during Bacterial Leaf Blight Disease**" submitted to Central university of Kerala in partial fulfilment of the requirements for the award of the degree of Master of Science in Botany is a bonafide record of original research work done by me under the supervision and guidance of **Dr.Ginny Antony**, Assistant professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the Project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



ANJANA HAREENDRAN K.V

Place: Tejaswini hills, Periyar.

Date: 22/05/2021

**In vitro propagation and preliminary phytochemical
analysis in *Centrosema molle* Mart. ex Benth,**

DISSERTATION

Submitted to the Central University of Kerala in partial
fulfilment of the requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

ANJANA RK

Reg. No: BPS051907



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD
MAY 2021**

DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CERTIFICATE

This is to certify that the Dissertation titled **In vitro propagation and preliminary phytochemical analysis in *Centrosema molle* Mart. ex Benth**, is an authentic research work accomplished by Ms. ANJANA R.K at Central University of Kerala under my supervision. This work has not been submitted any other universities or institution for the award of any degree.

Signature of Supervisor

Dr. Dennis Thomas T
Professor
Department of Plant Science
Central University of Kerala

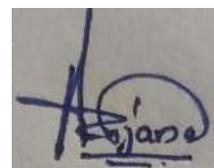
Signature of HoD

Dr. K Arun Kumar
Professor and Head
Department of Plant Science
Central University of Kerala

Signature of the Examiner

DECLARATION

I hereby declared that the dissertation entitled **In vitro propagation and preliminary phytochemical analysis in *Centrosema molle* Mart. ex Benth,** has been composed solely by myself under the supervision of Dr. Dennis Thomas T, Professor, Central University of Kerala in partial fulfilment for the award of Master of Science in Plant Science. I also declared that this work has not been submitted in whole or in part for any of the degree in any universities or institutions.

A handwritten signature in blue ink, appearing to read 'Anjana', is enclosed in a rectangular box.

Place: Central University of Kerala

ANJANA

RK Date: 24-05-2021

BPS0519

07

**In *silico* analysis of putative binding sites of
abiotic stress-responsive transcription
factors in *Arabidopsis thaliana* DNA repair
genes and, their expression profiling**

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of requirement for the award of the Degree of
Master of Science in Botany*

By

ANJITHA R.
Reg. No. BPS051908

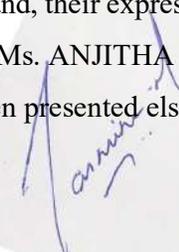
Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India
May, 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “*In silico* analysis of putative binding sites of abiotic stress-responsive transcription factors in *Arabidopsis thaliana* DNA repair genes and, their expression profiling” is a bona fide record of the dissertation work carried out by Ms. ANJITHA R. under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.


**Signature of the supervisor
the Department**

Dr. Jasmine M. Shah
Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.


Signature and seal of the Head of

23-May-2021

Periye

DECLARATION

I do hereby declare that this work entitled '**In silico analysis of putative binding sites of abiotic stress-responsive transcription factors in *Arabidopsis thaliana* DNA repair genes and their expression profiling.**' is a bona fide record of the original research work c was carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant science, Central university of Kerala, India. Also, the thesis is free from plagiarism after having checked using Grammarly® software and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periy

Date: 23/05/2021


Anjitha R.

**Micropropagation, phytochemical and
antibacterial studies in *Lepidagathis
ananthapuramensis* - a new species from the
lateritic plateaus of Kerala, India**

DISSERTATION

Submitted to the Central University of Kerala in partial fulfillment of the
requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

ARCHANA K

Reg.No: BPS051909



DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

MAY, 2021



CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This is to certify that the Dissertation entitled “**Micropropagation, phytochemical and antibacterial studies in *Lepidagathis ananthapuramensis* -new species from the lateritic plateaus of Kerala, India**” is an authentic record of the research work accomplished by Ms. ARCHANA K at Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis in full or in parts have not been submitted to any other institute or University for the award of any degree or diploma.

Signature of the supervisor
Dr. Dennis Thomas T
Professor
Department of Plant Science
Central University of Kerala
Kasaragod

Signature of HOD
Dr. K. Arunkumar
Professor
Department of Plant Science
Central University of Kerala
Kasaragod

Signature of Examiner

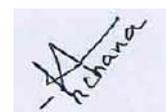
DECLARATION

I hereby declare that the work entitled “Micropropagation, phytochemical and antibacterial studies in *Lepidagathis ananthapuramensis* - a new species from the lateritic plateaus of Kerala, India” submitted to Central University of Kerala in partial fulfillment of the requirements for the award of degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of Dr. Dennis Thomas T, Professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the Project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.

Place: Central University of Kerala

Kasaragod

Date: 17-05-2021



Archana K

BTY051909

**Investigating the role of *Xanthomonas axonopodis*
pv. *punicae* type III effector *xop V***

THESIS

*Submitted to the Central University of Kerala in partial fulfillment of
the requirement for the award of the Degree of*

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

ARCHANA K NAIR.

Reg.No:BTY051910



DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

MAY 2021

**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**



CERTIFICATE

This is to certify that the Dissertation entitled “**Investigating the role of *Xanthomonas axonopodis* pv. *punicae* type III effector *xop V*”** is an authentic record of the research work accomplished by Ms. ARCHANA K NAIR towards partial fulfillment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

**Prof. (Dr.) K Arun Kumar
Head, Department of Plant Science
Central University of Kerala,
Kasaragod**

**Dr. Ginny Antony
Assistant Professor
Dept. of Plant Science**

External Examiner:

Place: Periy

Date:

DECLARATION

I hereby declare that the project entitled "**Investigating the role of *Xanthomonas axonopodis* pv. *punicae* type III effector *xop V***" submitted to Central university of Kerala in partial fulfillment of the requirements for the award of the degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of **Dr. Ginny Antony**, Assistant professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the Project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.

ARCHANA K NAIR.



Place: **Periye**

Date: **17 May 2021**

**In vitro propagation, Phytochemical and antibacterial
studies in *Calotropis gigantea* Linn. R. Br,**

DISSERTATION

Submitted to the Central University of Kerala in partial
fulfilment of the requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

ARPITHA M

Reg. No: BPS051911



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**

DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CERTIFICATE

This is to certify that the Dissertation titled ***In vitro* propagation, phytochemical and antibacterial studies in *Calotropis gigantea* Linn. R. Br,** is an authentic research work accomplished by Ms. ARPITHA M at Central University of Kerala under my supervision. This work has not been submitted by any other universities or institution for the award of any degree.

Signature of Supervisor

Dr. Dennis Thomas T
Professor
Department of Plant Science
Central University of Kerala

Signature of HoD

Dr. K Arun Kumar
Professor and Head
Department of Plant Science
Central University of Kerala

Signature of the Examiner

DECLARATION

I hereby declare that the dissertation entitled ***In vitro* propagation, Phytochemical and antibacterial studies in *Calotropis gigantea* Linn. R. Br.**, has been composed solely by myself under the supervision of Dr. Dennis Thomas T, Professor, Central University of Kerala in partial fulfilment for the award of Master of Science in Plant Science. I also declare that this work has not been submitted in whole or in part for any of the degree in any universities or institutions.



Place: Central University of

Kerala

ARPIT

HA M Date: 24-05-

2021

BPS

051911

EVALUATION OF THE BIOFUEL POTENTIAL OF FINGER MILLET BIOMASS

Submitted in partial fulfilment of requirements for the degree of

MASTER OF SCIENCE IN BOTANY

by

ASHLY BABU

BPS051912

under the guidance of

Dr. CHITHRA MANISSERI



**DEPARTMENT OF PLANT SCIENCE
SCHOOL OF BIOLOGICAL SCIENCES
CENTRAL UNIVERSITY OF KERALA
PERIYE, 671 320**

KASARAGOD, KERALA, INDIA

MAY, 2021

CERTIFICATE

This is to certify that the M.Sc. dissertation entitled '**EVALUATION OF THE BIOFUEL POTENTIAL OF FINGER MILLET BIOMASS**' is a bonafide record of the dissertation work carried out by **Ms. ASHLY BABU** under my guidance and supervision that no parts of this have been presented before for the award of any degree or diploma.



Signature of the supervisor

Dr. Chithra Manisseri
Assistant professor
Department of Plant Science
School of Biological Sciences
Periye- 671 320
Kasaragod, Kerala, India

Signature of the Examiner



Signature of HOD

Dr. K. Arun Kumar
Professor
Department of Plant Science
School of Biological Sciences
Central University of Kerala
Periye- 671 320
Kasaragod, Kerala, India

May, 2021

Periye

DECLARATION

I hereby declare that the project entitled “**EVALUATION OF THE BIOFUEL POTENTIAL OF FINGER MILLET BIOMASS**” is a bonafide record of the original research work carried out by me under the guidance of Dr. Chithra Manisseri, Assistant professor, Department of Plant science, Central university of Kerala and that no parts of this report has been presented earlier for any other degree, diploma or similar titles of any other university.



ASHLY BABU

Periye

23- 05- 2021

SCREENING OF EXTRACELLULAR LACCASE ACTIVITY IN SOIL BACTERIA

DISSERTATION

*Submitted in partial fulfilment of requirement for the award of the
Degree of*

MASTER OF SCIENCE

IN

BOTANY

ASWIN S KUMAR

BPS051913

Under the guidance of

Dr CHITHRA MANISSERI



**DEPARTMENT OF PLANT SCIENCE
SCHOOL OF BIOLOGICAL SCIENCE
CENTRAL UNIVERSITY OF KERALA
PERIYE, 671316
KASARAGOD, KERALA, INDIA
APRIL, 2020**

CERTIFICATE

This is to certify that the M.Sc. dissertation titled “**SCREENING OF EXTRACELLULAR LACCASE ACTIVITY IN SOIL BACTERIA**” is a bonafide record of the dissertation work carried out by Mr ASWIN S. KUMAR under my guidance and supervision that no parts of these has been presented before for the award of any degree or diploma.



Signature of the supervisor

Dr Chithra Manisseri
Assistant Professor
Department of Plant Science
Periya – 671 316
Kasaragod, Kerala.

Signature of the supervisor



Signature of HOD

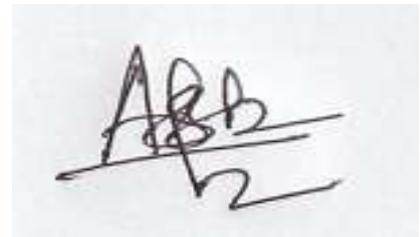
Dr K Arun Kumar
Professor,
Department of Plant Science,
Central University of Kerala
Periya – 671 316
Kasaragod, Kerala.

Periya

May 2021

DECLARATION

I hereby declare that the project entitled “**SCREENING OF EXTRACELLULAR LACCASE ACTIVITY IN SELECTED SOIL BACTERIA**” is a bonafide record of the original research work carried out by me under the guidance of Dr Chithra Manisseri, Assistant professor, Department of Plant Science, Central University of Kerala and that no parts of this report have been presented earlier for any other degree, diploma or similar titles of any other university.

A handwritten signature in black ink, appearing to read 'ASWIN S KUMAR', written over a light blue background.

Periya

ASWIN S KUMAR

May 2021

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department Of Plant Science



CERTIFICATE

This is to certify that the dissertation titled
**Cell wall based biochemical study of *Kandelia candel* (L.) Druce roots in response to
salinity stress**

is a bonafide work done by

AYSHA ROOBY M. K

BTY051914

IV Semester M. Sc. Plant Science

Supervised by

Dr. Ajay Kumar (Assistant Professor)

Department of Plant Science

Central University of Kerala

Kasaragod



केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department Of Plant Science

CERTIFICATE

This is to certify that the dissertation entitled “**Cell wall based biochemical study of *Kandelia candel* (L.) Druce roots in response to salinity stress**” submitted by Aysha Rooby M.K, BTY051914 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Dr. Ajay Kumar

Signature of Examiner

**Signature of HOD
Prof. (Dr) K. Arun Kumar, Head**

DECLARATION

I hereby declare that this work has been carried out by me under the guidance of and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



Place: Periy

Aysha Rooby M.K

Date: 23/05/2021

BTY051914

**Analysing the regulation and expression of
Arabidopsis thaliana transcription factors involved
in pathogenesis**

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of requirement for the award of the Degree of
Master of Science in Botany*

By

DRISHYA D

Reg. No. BTY051915

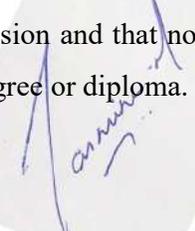
Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India
May, 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “Analysing the regulation and expression of *Arabidopsis thaliana* transcription factors involved in pathogenesis” is a bona fide record of the dissertation work carried out by Ms. DRISHYA D. under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.


**Signature of the supervisor
the Department**

Dr. Jasmine M. Shah
Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.


Signature and seal of the Head of

23-May-2021

Periye

DECLARATION

I do hereby declare that this work entitled '**Analyzing the regulation and expression of *Arabidopsis thaliana* transcription factors involved in pathogenesis**' is a bona fide record of the original research work was carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant science, Central University of Kerala, India. . Also, the thesis is free from plagiarism after having checked using plagiarism checker (<https://smallseotools.com>) software and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periyar

Date: 23/05/2021



DRISHYA D

**Micropropagation, phytochemical and antibacterial studies in
Gliricidia sepium (Jacq.) Kunth ex Walp**

DISSERTATION

Submitted to the Central University of Kerala in partial fulfilment of
the requirement for the award of the Degree of
MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

FEMINA K

Reg. No.BPS051916



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD
MARCH, 2021**

DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CERTIFICATE

This is to certify that the Dissertation entitled Micropropagation, phytochemical and antibacterial studies in *Gliricidia sepium* (Jacq.) Kunth ex Walp is an authentic record of the research work accomplished by Ms. FEMINA K at Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis in full or in parts have not been submitted to any other institute or University for the award of any degree or diploma.

Signature of the supervisor

Dr. Dennis Thomas T

Professor

Department of plant science

Central University of Kerala,

Kasargod

Signature of the supervisor

Dr. K Arun Kumar

Professor and Head

Department of plant science

Central University of Kerala,

Kasargod

Signature of the examiner

DECLARATION

I hereby declare that the project entitled “**Micropropagation, phytochemical and antibacterial studies in Gliricidia sepium (Jacq.) Kunth ex Walp**” submitted to Central University of Kerala in partial fulfilment of the requirements for the award of degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of Dr. Dennis Thomas T, Professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



Place: Central University of Kerala,

Femina k

Kasaragod

BPS051916

PROFILING OF REGULATORY REGIONS AND EXPRESSION PATTERNS OF GENES INVOLVED IN SYSTEMIC ACQUIRED RESISTANCE

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of requirement for the award of the Degree of
Master of Science in Botany*

By
HENNA PARVEEN K.
Reg. No. BPSO51918

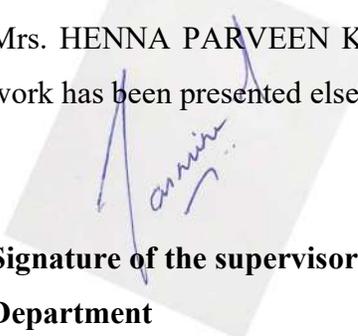
Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India
MAY 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “PROFILING OF REGULATORY REGIONS AND EXPRESSION PATTERNS OF GENES INVOLVED IN SYSTEMIC ACQUIRED RESISTANCE” is a bona fide record of the dissertation work carried out by Mrs. HENNA PARVEEN K. under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.


Signature of the supervisor

Department

Dr. Jasmine M. Shah
Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.


Signature and seal of the Head of the

23-May-2021

Periye

DECLARATION

I do hereby declare that this work entitled '**PROFILING OF REGULATORY REGIONS AND EXPRESSION PATTERNS OF GENES INVOLVED IN SYSTEMIC ACQUIRED RESISTANCE**' is a bonafide record of the original research work carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant science, Central university of Kerala, India. Also, the thesis is free from plagiarism after having checked using Duplichecker software and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periy

Date: 23/05/2021



HENNA PARVEEN K.

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science



CERTIFICATE

This is to certify that the dissertation titled
Analysis of nutritional and antioxidant components of underutilized food crops

is a bonafide work done by

INDUKUMARI U K

BPS051919

IV Semester M. Sc. Plant Science

Supervised by

Dr. Ajay Kumar (Assistant Professor)

Department of Plant Science

Central University of Kerala

Kasaragod



केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science

CERTIFICATE

This is to certify that the dissertation entitled “**Analysis of nutritional and antioxidant components of underutilized food crops**” submitted by INDUKUMARI U K, BPS051919 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Examiner

Dr. Ajay Kumar

Signature of

Signature of HOD
Prof. (Dr) K. Arun Kumar, Head

DECLARATION

I hereby declare that this work has been carried out by me under the guidance and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



Place: Periy

INDUKUMARI U K

Date: 23/05/2021

BPS051919

CERTIFICATE

This is to certify that the dissertation titled
**Extraction, characterization and biological activities of fucoxanthin in the
decoction prepared from four brown seaweeds for value addition to Tea**

DISSERTATION

Submitted to Central University of Kerala in the partial fulfilment of the requirement
for the award of Degree of

Master of Science in Plant Science

Submitted by

NALLURI MADHURI

BPS051920



Department of Plant Science

Central University of Kerala, Kasaragod

May 2021.

DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This to certify that the dissertation entitled “**Extraction, characterization and biological activities of fucoxanthin in the decoction prepared from four brown seaweeds for value addition to Tea**” submitted by N. Madhuri, BTY0519820 toward the partial fulfilment for the Degree of Master of science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of the Supervisor

Dr. K. Arun Kumar

Professor

Head, Department of Plant Science

Central University of Kerala

Signature of Examiner

Signature of HOD

Dr. K. Arun Kumar

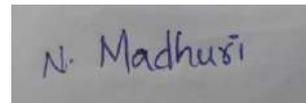
Professor

Head, Department of Plant Science

Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance of and supervision of Dr. K. Arun Kumar, Associate Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.

A rectangular box containing a handwritten signature in blue ink that reads "N. Madhuri".

Place: Kasargod

Date: 24/05/2021

N. Madhuri

BPS051920

CLONING OF TAL EFFECTOR GENES FROM
Xanthomonas axonopodis pv. *punicae*

THESIS

Submitted to the Central University of Kerala in partial fulfilment of the
requirement for the award of the Degree of

MASTER OF SCIENCE IN BOTANY

Submitted by

NIMITHA K

Reg.No:BPS051921



DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD
MAY 2021

**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**



CERTIFICATE

This is to certify that the Dissertation entitled “**CLONING OF TAL EFFECTOR GENES FROM *Xanthomonas axonopodis* pv. *punicae***” is an authentic record of the research work accomplished by Ms. NIMITHA K. towards partial fulfilment for the Degree of Master of Science in Botany, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

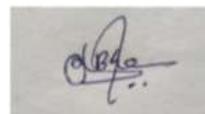
Prof. ArunKumar K.
Head, Department of Plant Science
Central University of Kerala,
Kasaragod

Dr. Ginny Antony
Assistant Professor
Dept. of Plant Science

External Examiner:
Place: Tejaswini hills, Periy
Date: 22/5/2021

DECLARATION

I hereby declare that the project entitled “**CLONING OF TAL EFFECTOR GENES FROM *Xanthomonas axonopodis* pv. *punicae***” submitted to Central university of Kerala in partial fulfilment of the requirements for the award of the degree of Master of Science in Botany is a bonafide record of original research work done by me under the supervision and guidance of **Dr. Ginny Antony**, Assistant professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



NIMITHA K

Place: Tejaswini hills, Periyar

Date: 22/5/2021

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science



CERTIFICATE

This is to certify that the dissertation titled
Screening of ignored traditional leafy vegetables for nutritional and antioxidant
components

is a bonafide work done by
NISHMITHA KUMARI S R RAI
BPS051922

IV Semester M. Sc. Plant Science

Supervised by
Dr. Ajay Kumar (Assistant Professor)
Department of Plant Science
Central University of Kerala
Kasaragod



केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science

CERTIFICATE

This is to certify that the dissertation entitled "Screening of ignored traditional leafy vegetables for nutritional and antioxidant components" submitted by Nishmitha Kumari S R Rai, BPS051922 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Dr. Ajay Kumar

Signature of Examiner

**Signature of HOD
Prof. (Dr) K. Arun Kumar, Head**

DECLARATION

I hereby declare that this work has been carried out by me under the guidance of and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



Place: Periy

Nishmitha Kumari S R Rai

Date: 23/05/2021

BPS051922

**ISOLATION AND SCREENING OF SOIL BACTERIA
PRODUCING ACETYL XYLAN ESTERASE AND
XYLANASE**

DISSERTATION

*Submitted in partial fulfilment of requirement for the award of the
Degree of*

MASTER OF SCIENCE

IN

BOTANY

PULI SRI LAKSHMI POOJITHA

BPS051923

Under the guidance of

Dr. CHITHRA MANISSERI



**DEPARTMENT OF PLANT SCIENCE
SCHOOL OF BIOLOGICAL SCIENCE
CENTRAL UNIVERSITY OF KERALA
PERIYE, 671316
KASARAGOD, KERALA, INDIA
MAY, 2019**

CERTIFICATE

This is to certify that the M.Sc. dissertation entitled 'ISOLATION AND SCREENING OF SOIL BACTERIA PRODUCING ACETYL XYLAN ESTERASE AND XYLANASE' is a bonafide record of the dissertation work carried out by Ms. PULI SRI LAKSHMI POOJITHA under my guidance and supervision that no parts of these has been presented before for the award of any degree or diploma.



Signature of the Examiner

Signature of the supervisor

Dr. Chithra Manisseri
Assistant professor
Department of Plant Science
School of Biological Science
Periya – 671 316
Kasaragod, Kerala



Signature of HOD

Prof. K. Arunkumar,
Head of department
Plant Science
School of Biological Sciences
Central University of Kerala
Periye-671 320
Kasaragod, Kerala

DECLARATION

I hereby declare that the project entitled “ISOLATION AND SCREENING OF SOIL BACTERIA PRODUCING ACETYL XYLAN ESTERASE AND XYLANASE’ is a bonafide record of the original research work carried out by me under the guidance of Dr. Chithra Manisseri, Assistant professor, Department of Plant Science, Central University of Kerala and that no parts of this report has been presented earlier for any other degree, diploma or similar titles of any other university

P. S. L. Poojitha.

PULI SRI LAKSHMI POOJITHA

May

Periya

CERTIFICATE

This is to certify that the dissertation titled
Nanoparticles synthesized by compounds of marine algae for drug
delivery

DISSERTATION

Submitted to

Central University of Kerala in the partial fulfilment of the requirement for the
award of Degree of

Master of Science in Plant Science

Submitted by

PRIYANKA RATHOD

BPS051924



Department of Plant science

Central university of Kerala, Kasaragod

May 2021

CERTIFICATE

This to certify that the dissertation entitled “Nanoparticles synthesized by compounds of marine algae for drug delivery” submitted by PRIYANKA RATHOD toward the partial fulfilment of the requirements for Degree of Master of science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation work has not been submitted either partially or fully for any other degree or fellowship of this or any other university.



Signature of the Supervisor

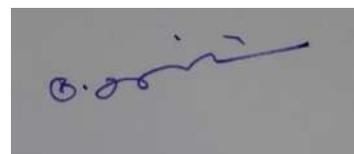
Dr. K. Arun Kumar

Professor

Department of Plant Science

Central University of Kerala

Signature of Examiner



Signature of HOD

Dr. K. Arun Kumar

Professor

Department of Plant Science

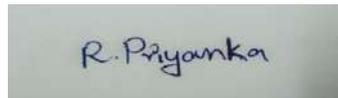
Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance of and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.

Place: Kasaragod

Date: 21/05/2021

A rectangular box containing a handwritten signature in blue ink that reads "R. Priyanka".

PRIYANKA RATHOD

BPS051924

**Phytochemical and Antibacterial activity of *Rhynchoisa aurea*
(Willd.) DC. Leaf extracts.**

DISSERTATION

Submitted to the Central University of Kerala in partial
fulfilment of the requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

REDDYMALLA VENKATESH

Reg. No: BPS051925



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**

MAY 2021

DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CERTIFICATE

This is to certify that the Dissertation titled **Pytochemical and Antibacterial activity of *Rhynchosia aurea* (Willd.) DC. Leaf extracts** is an authentic research work accomplished by Mr. REDDYMALLA VENKATESH at Central University of Kerala under my supervision. This work has not been submitted any other universities or institution for the award of any degree.

Signature of Supervisor

Dr. Dennis Thomas T

Professor

Department of Plant Science

Central University of Kerala

Signature of HoD

Dr. K Arun Kumar

Professor and Head

Department of Plant Science

Central University of Kerala

Signature of the Examiner

DECLARATION

I hereby declared that the dissertation entitled **Phytochemical and Antibacterial activity of *Rhynchosia aurea* (Willd.) DC. Leaf extracts** has been composed solely by myself under the supervision of Dr. Dennis Thomas T, Professor, Central University of Kerala in partial fulfilment for the award of Master of Science in Plant Science. I also declared that this work has not been submitted in whole or in part for any of the degree in any universities or institutions.

Place: Central University of Kerala

VENKATESH Date: 25-05-2021



REDDYMALLA

BPS051925

**VALIDATION OF GENE EXPRESSION PATTERN OF HOST
TARGETS DURING BACTERIAL BLIGHT DISEASE OF RICE**

THESIS

*Submitted to the Central University of Kerala in partial fulfillment of
the requirement for the award of the Degree of*

MASTER OF SCIENCE IN BOTANY

Submitted by

RAHNA RAJ P

Reg.No: BPS051926



DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

MAY 2021

**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD**



3/36

CERTIFICATE

This is to certify that the Dissertation entitled "**validation of gene expression pattern of candidate host targets during Bacterial Blight disease of rice**" is an authentic record of the research work accomplished by Ms. RAHNA RAJ. P towards partial fulfillment for the Degree of Master of Science in Botany, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Prof. Dr. K. Arun Kumar
Head, Department of Plant Science
Central University of Kerala,
Kasaragod

Dr. Ginny Antony
Assistant Professor
Dept. of Plant Science

External Examiner:

Place: Tejaswini hills, Periyar.

Date:

DECLARATION

I hereby declare that the project entitled “**validation of gene expression pattern of candidate host targets during Bacterial Blight disease of rice**” submitted to Central university of Kerala in partial fulfillment of the requirements for the award of the degree of Master of Science is a bonafide record of original research work done by me under supervision and guidance of **Dr. Ginny Antony**, Assistant professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the Project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



RAHNA RAJ P

Place: **Central University of Kerala, Kasaragod**

Date: **14/5/2021**

**Volume to surface-area ratio on the growth of three microalgae-
Coalestrella saipanensis, *Chroococcus* sp. and *Haematococcus*
*pluvialis***

DISSERTATION

Submitted to Central University of Kerala in the partial fulfillment of the
requirement for the award of the degree of

Master of Science in Plant Science

Submitted by

RASHIDA

BTY051927



Department of Plant Science

Central University of Kerala



CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This is to certify that the dissertation entitled “Volume to surface-area ratio on the growth of three microalgae- *Coalestrella saipanensis*, *Chroococcus* sp. and *Haematococcus pluvialis*” submitted by Rashida, BTY051927 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Prof. (Dr) K. Arun Kumar, Head
Department of Plant Science
Central University of Kerala

Signature of the examiner

Signature of HOD

Prof. (Dr) K. Arun Kumar, Head
Department of Plant Science
Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance of and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.

Date: 12/05/2021

Place: Periyé



Rashida

BTY051927.

**Micropropagation, phytochemical and antibacterial
studies in *Dregea volubilis* Benth.**

DISSERTATION

Submitted to the Central University of Kerala in partial
fulfillment of the requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

RESHMA JOHN

Reg. No.BPS051928



**DEPARTMENT OF PLANT SCIENCE CENTRAL
UNIVERSITY OF KERALA, KASARAGOD**

MARCH, 2021

**DEPARTMENT OF PLANT SCIENCE CENTRAL
UNIVERSITY OF KERALA, KASARAGOD**



CERTIFICATE

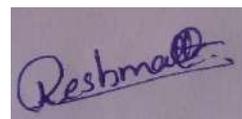
This is to certify that the Dissertation entitled “**Micropropagation, phytochemical and antibacterial studies in *Dregea volubilis* Benth.**” is an authentic record of the research work accomplished by Ms. RESHMA JOHN at Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis in full or in parts have not been submitted to any other institute or University for the award of any degree or diploma.

Signature of the supervisor
Dr. Dennis Thomas T
Professor
Department of Plant Science
Central University of Kerala
Kasaragod

Signature of HOD
Dr. K Arun Kumar
Professor and Head
Department of Plant Science
Central University of Kerala
Kasaragod

DECLARATION

I hereby declare that the project entitled “**Micropropagation, phytochemical and antibacterial studies in *Dregea volubilis* Benth.**” submitted to Central University of Kerala in partial fulfillment of the requirements for the award of degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of Dr. Dennis Thomas T, Professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



Place: Central University of Kerala, Kasaragod
Date:

RESHMA JOHN
BPS051928

केरलकेन्द्रीयविश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पतिविज्ञानविभाग
Department of Plant Science



CERTIFICATE

**This is to certify that the dissertation titled
*Anatomical responses to salinity stress in *Kandeliacandel* (L.) Druce with special emphasis on
suberin, lignin deposition and aerenchym formation in its roots***

is a bonafide work done by

RESHMA P

BTY051929

IV Semester M. Sc. Plant Science

Supervised by

Dr. Ajay Kumar (Assistant Professor)

Department of Plant Science

Central University of Kerala, Kasaragod



केरलकेंद्रीयविश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पतिविज्ञानविभाग
Department of Plant Science

CERTIFICATE

This is to certify that the dissertation entitled “**Anatomical responses to salinity stress in *Kandeliacandel (L.) Druce with special emphasis on suberin, lignin deposition and aerenchym formation in its roots*” submitted by Reshma P. BTY051929 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.**

**Signature of Supervisor
Examiner**

Dr. Ajay Kumar

Signature of

**Signature of HOD
Prof. (Dr) K. Arun Kumar, Head**

DECLARATION

I hereby declare that this work has been carried out by me under the guidance of and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



Place: Periy

Date:05/04/2021

RESHMA P

BTY051929

Profiling of putative regulatory regions and expression of genes involved in Induced Systemic Resistance

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of the requirement for the award of the Degree
of Master of Science in Botany*

By

Riniya Najeeb
Reg. No. BPS051930

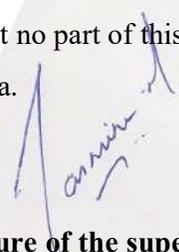
Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India
May 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “Profiling of putative regulatory regions and expression of genes involved in Induced Systemic Resistance” is a bona fide record of the dissertation work carried out by Ms. Riniya Najeeb under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.


**Signature of the supervisor
the Department**

Dr. Jasmine M. Shah
Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.


Signature and seal of the Head of

23-May-2021

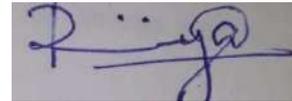
Periye

DECLARATION

I do hereby declare that this work entitled '**Profiling of putative regulatory regions and expression of genes involved in Induced Systemic Resistance**' is a bona fide record of the original research work was carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant Science, Central University of Kerala, India. Also, the thesis is free from plagiarism after having checked using the Plagiarism Checker X online tool (<https://plagiarismcheckerx.com/>) and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periy

Date: 23/05/2021



Riniya Najeeb

केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science



CERTIFICATE

This is to certify that the dissertation titled
**Proximate Composition Analysis and Mineral Profiling of Selected Traditional Leafy
Vegetables**

is a bonafide work done by

SAJANA S

BPS051931

IV Semester M. Sc. Plant Science

Supervised by

Dr. Ajay Kumar (Assistant Professor)

Department of Plant Science

Central University of Kerala

Kasaragod



केरल केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF KERALA
वनस्पति विज्ञान विभाग
Department of Plant Science

CERTIFICATE

This is to certify that the dissertation entitled “Proximate composition analysis and mineral profiling of selected traditional leafy vegetables” submitted by SAJANA S, BPS051931 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, at Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of Supervisor

Dr. Ajay Kumar

Signature of Examiner

Signature of HoD

Prof. Dr. K. Arun Kumar

DECLARATION

I hereby declare that the work entitled “Proximate composition analysis and mineral profiling of selected traditional leafy vegetables” has been carried out by me under the guidance of and supervision of Dr. Ajay Kumar, Assistant Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.

Place: Periyé

Date: 17/05/2021



Sajana S

BPS051931

**Phytochemical and antibacterial analysis in
Crotalaria pallida Aiton**

DISSERTATION

Submitted to the Central University of Kerala in partial fulfilment of
the requirement for the award of the Degree of

MASTER OF SCIENCE IN PLANT SCIENCE

Submitted by

SANDEEP KUMAR MOHANTA

Reg. No. BPS051932



**DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD
MARCH, 2021**

DEPARTMENT OF PLANT SCIENCE
CENTRAL UNIVERSITY OF KERALA, KASARAGOD



CERTIFICATE

This is to certify that the Dissertation entitled “**Phytochemical and antibacterial analysis in *Crotalaria pallida* Aiton**” is an authentic record of the research work accomplished by Mr. SANDEEP KUMAR MOHANTA at Central University of Kerala, Kasaragod under my guidance and supervision. The contents of this thesis in full or in parts have not been submitted to any other institute or University for the award of any degree or diploma.

Signature of the supervisor

Dr. Dennis Thomas T

Professor

Department of plant science

Central University of Kerala

Kasaragod

Signature of the HOD

Dr. K Arun Kumar

Professor and Head

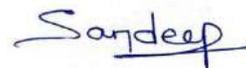
Department of plant science

Central University of Kerala,

Kasaragod

DECLARATION

I hereby declare that the project entitled **Phytochemical and antibacterial analysis in *Crotalaria pallida* Aiton** submitted to Central University of Kerala in partial fulfilment of the requirements for the award of degree of Master of Science in Plant Science is a bonafide record of original research work done by me under the supervision and guidance of Dr. Dennis Thomas T, Professor, Department of Plant Science, Central University of Kerala, Kasaragod. I also declare that the project has not been submitted partially or fully for the award of any other degree or diploma title or recognition.



Place: Central University of Kerala,
Mohanta

Sandeep Kumar

Kasaragod

BPS051932

Date: 23/05/2021

CERTIFICATE

This is to certify that the dissertation titled
**Isolation of protein from the red seaweed *Gracillaria edulis*
associated with endophytic bacteria**

DISSERTATION

**Submitted to Central University of Kerala in the partial fulfilment of the
requirement for the award of Degree of**

Master of Science in Plant Science

Submitted by

SHAIJAL K

BTY051933



Department of Plant Science

Central University of Kerala, Kasaragod

May 2021

DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

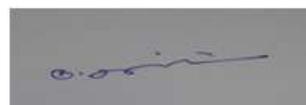
This to certify that the dissertation entitled “**Isolation of protein from the red seaweed *Gracillaria edulis* associated with endophytic bacteria**” submitted by SHAIJAL K, BTY051933 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod is based on the research carried out by him under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree



Signature of Supervisor

Dr. K. Arun Kumar
Professor
Head, Department of Plant Science
Central University of Kerala

Signature of Examiner

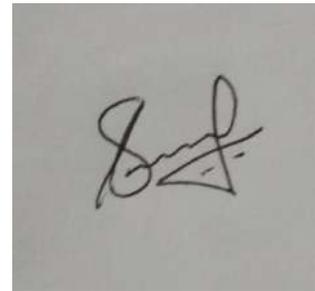


Signature Head of Department

Dr. K. Arun Kumar
Professor
Head, Department of Plant Science
Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and this work has not been submitted in any other degree or certificate.

A square box containing a handwritten signature in black ink. The signature is stylized and appears to be 'Shaijal K'.

PLACE: KASARAGOD

DATE: 23/05/2021

SHAIJAL K

BTY051933

**Promoter Analysis of Genes Involved In Epigenetic
Regulation In *Arabidopsis* And, Their Expression Profiling
During Pathogen Stress**

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of requirement for the award of the Degree of
Master of Science in Botany*

By
SHANIBA

Reg. No. BPSO51934

Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India

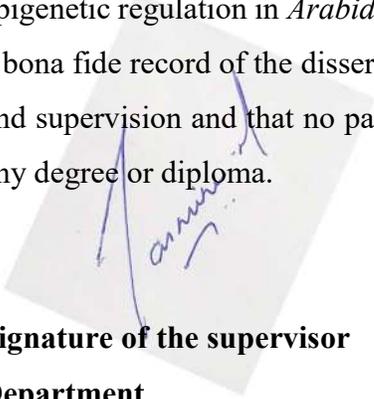
May, 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “Promoter analysis of genes involved in epigenetic regulation in *Arabidopsis* and, their expression profiling during pathogen stress” is a bona fide record of the dissertation work carried out by Ms. SHANIBA under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.


Signature of the supervisor

Department

Dr. Jasmine M. Shah
Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.

23-May-2021

Periye


Signature and seal of the Head of the

DECLARATION

I do hereby declare that this work entitled '**Promoter analysis of genes involved in epigenetic regulation in *Arabidopsis* and, their expression profiling during pathogen stress**' is a bona fide record of the original research work carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant science, Central university of Kerala, India. Also, the thesis is free from plagiarism after having checked using the tool Duplichecker and Grammarly® software and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periy

Date: 23/05/2021



SHANIBA

Delignification efficiency of acidic ionic liquid [TEA][HSO₄] on grass biomass

DISSERTATION

Submitted to partial fulfilment of the requirement towards award of
the Degree of

MASTER OF SCIENCE

IN

BOTANY

SHIMA N N

BTY051935

Under the Guidance of

Dr. CHITHRA MANISSERI



**DEPARTMENT OF PLANT SCIENCE
SCHOOL OF BIOLOGICAL SCIENCES
CENTRAL UNIVERSITY OF KERALA**

PERIYE, 671316

KASRAGOD, KERALA, INDIA

MAY, 2021

CERTIFICATE

This is to certify that the M.Sc. dissertation titled '**Delignification efficiency of acidic ionic liquid [TEA][HSO₄] on grass biomass**' is a bonafide record of the dissertation work carried out by Ms. SHIMA N N under my guidance and supervision that no parts of these has been presented before for the award of any degree or diploma.



Signature of the supervisor

Dr. Chithra Manisseri

Assistant professor

Department of Plant Science

School of Biological Science

Periye – 671316

Kasaragod, Kerala.

MAY, 2021

Signature of the Examiner



Signature of HOD

Dr.K. Arunkumar

Head of department

Plant science

School of Biological sciences

Central university of Kerala

Periye – 671316, Kasaragod, Kerala.

DECLARATION

I hereby declare that the project entitled “**Delignification efficiency of acidic ionic liquid [TEA][HSO₄] on grass biomass**” is a bonafide record of the original research work carried out by me under the guidance of Dr. Chithra Manisseri, Assistant professor, Department of Plant Science, Central university of Kerala and that no parts of this report has been presented earlier for any other degree, diploma or similar titles of any other university.

Periye

May 2021

A rectangular box containing a handwritten signature in blue ink. The signature is cursive and appears to read 'Shima N N'.

SHIMA N N

CERTIFICATE

This is to certify that the dissertation titled

**Characterization and biological activities of various fractions of extracts
obtained from the marine brown alga *Spathoglossum asperum* J. G. Agardh**

DISSERTATION

**Submitted to Central University of Kerala in the partial fulfillment of the
requirement for the award of Degree of**

Master of Science in Plant Science

Submitted by

SITHARA NAZAR PT

BPS051036



**Department of Plant Science
Central University of Kerala, Kasaragod
May 2021**



CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This to certify that the dissertation entitled “Characterization and biological activities of various fractions of extracts obtained from the marine brown alga *Spathoglossum asperum* J.G. Agardh” submitted by SITHARA NAZAR PT, BPS051036 toward the partial fulfillment for the Degree of Master of science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod is based on the research carried out by her under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.

Signature of the Supervisor

Dr. K. Arun Kumar

Professor

Department of Plant Science

Central University of Kerala

Signature of Examiner

Signature of HOD

Dr. K. Arun Kumar

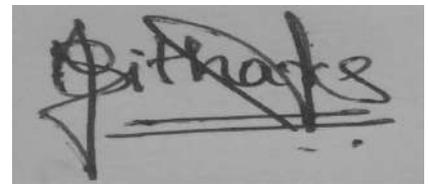
Professor

Department of Plant Science

Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance of and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and that this work has not been submitted in any other degree or certificate.



PLACE: KASARGOD

DATE: 04-05-2021

SITHARA NAZAR PT

BPS051936

***In Silico* Analysis of Putative Transcription Factor
Binding Sites and Expression Profiling of DNA Repair
Genes of *Arabidopsis thaliana***

Dissertation submitted to
Department of Plant Science



*In partial fulfillment of requirement for the award of the Degree of
Master of Science in Botany*

By

SRUTHI B

Reg. No. BTY051937

Department of Plant Science
School of Biological Sciences
Central University of Kerala
Tejaswini Hills, Periyar, 671320
Kasaragod, Kerala, India
May, 2021

**Department of Plant Science
Central university of Kerala, Kasaragod**



CERTIFICATE

This is to certify that the M.Sc. dissertation titled “*In Silico* Analysis of Putative Transcription Factor Binding Sites and Expression Profiling of DNA Repair Genes of *Arabidopsis thaliana*” is a bona fide record of the dissertation work carried out by Ms. SRUTHI B. under my guidance and supervision and that no part of this work has been presented elsewhere for the award of any degree or diploma.

Signature of the supervisor

Dr. Jasmine M. Shah

Assistant professor
Department of Plant Science
Central University of Kerala
Kasaragod, Kerala.

Signature of the Head of the Department

23-May-2021

Periye

DECLARATION

I do hereby declare that this work entitled “*In Silico* Analysis of Putative Transcription Factor Binding Sites and Expression Profiling of DNA Repair Genes of *Arabidopsis thaliana*” is a bona fide record of the original research work carried out by me under the guidance of **Dr. Jasmine M. Shah**, Assistant professor, Department of Plant science, Central university of Kerala, India. Also, the thesis is free from plagiarism after having checked using Plagiarism checker software (<https://plagiarismdetector.net/>) and no sentence, table, graph or section has been copied from previous work verbatim except at a very minimal level with due acknowledgement of the original sources. This work or any part thereof has not been submitted elsewhere earlier for any other degree, diploma or similar titles of any other University.

Place: Periyar

Date: 20/05/2021



SRUTHI B

**DELIGNIFICATION EFFICIENCY OF
DIFFERENT ORGANOSOLV PRETREATMENTS
ON SUGARCANE LEAVES**

DISSERTATION

Submitted to partial fulfilment of the requirement towards award of the degree of

MASTER OF SCIENCE

in

BOTANY

STARLET M M

BPS051938

Under the Guidance of

Dr. CHITHRA MANISSERI



DEPARTMENT OF PLANT SCIENCE

SCHOOL OF BIOLOGICAL SCIENCES

CENTRAL UNIVERSITY OF KERALA PERIYE,

671316

KASARAGOD, KERALA, INDIA

MAY 2021

CERTIFICATE

This is to certify that the dissertation entitled “DELIGNIFICATION EFFICIENCY OF DIFFERENT ORGANOSOLV PRETREATMENTS ON SUGARCANE LEAVES” submitted by Starlet M M BPS051938 towards partial fulfilment of the requirement towards award of the degree of Master of Science, Department of Plant science, School of Biological science, Central University of Kerala, Kasaragod, Kerala state, is based on the original research carried out under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere any other degree.



Signature of Supervisor

Dr. Chithra Manisseri

Dept of Plant science

Central University of Kerala

Signature of Examiner



Signature of HOD,

Prof. Dr. Arun Kumar

Department of Plant science

Central University of Kerala

DECLARATION

I hereby declare that the project entitled “**DELIGNIFICATION EFFICIENCY OF DIFFERENT ORGANOSOLV PRETREATMENTS ON SUGARCANE LEAVES**” is a bonafide record of the original research work carried out by me under the guidance of Dr. Chithra Manisseri, Assistant professor, Department of Plant science, Central university of Kerala and that no parts of this report have been presented earlier for any other degree, diploma or similar titles of any other university.

23 MAY 2021

Periye



STARLET M M

BPS051938

CERTIFICATE

This is to certify that the dissertation titled

Characterization and biological activity of fractionated and depolymerized polysaccharide extracted from red seaweed *Solieria robusta* (Greville) Kylin

DISSERTATION

Submitted to Central University of Kerala in the partial fulfillment of the
requirement for the award of Degree of

Master of Science in Plant Science

Submitted by

VISHNU C K

BPS051939



Department of Plant Science

Central University of Kerala, Kasaragod

May 2021

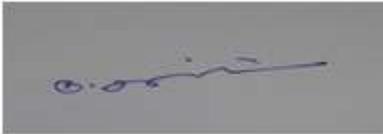
DEPARTMENT OF PLANT SCIENCE

CENTRAL UNIVERSITY OF KERALA, KASARAGOD

CENTRAL UNIVERSITY OF KERALA

CERTIFICATE

This to certify that the dissertation entitled “**Characterization and biological activity of fractionated and depolymerized polysaccharide extracted from red seaweed *Solieria robusta* (Greville) Kylin**” Submitted by VISHNU C K, BPS051939 toward the partial fulfilment for the Degree of Master of Science in Plant Science, Department of Plant Science, School of Biological Sciences, Central University of Kerala, Kasaragod is based on the research carried out by him under my guidance and supervision. It is further certified that this dissertation or any part has not been submitted elsewhere for any other degree.



Signature of Supervisor

Dr. K. Arun Kumar

Professor

Head, Department of Plant Science

Central University of Kerala

Signature of Examiner



Signature Head of Department

Dr. K. Arun Kumar

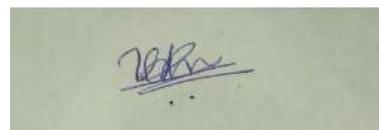
Professor

Head, Department of Plant Science

Central University of Kerala

DECLARATION

I hereby do declare that this work has been carried out by me under the guidance and supervision of Dr. K. Arun Kumar, Professor, Department of Plant Science, Central University of Kerala, Kasaragod and this work has not been submitted in any other degree or certificate.



PLACE : KASARAGOD

DATE : 21/05/2021

VISHNU C K

BPS051939